What do they mean by "success"? Contributors to perceived success in a telementoring program for adolescents

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Abstract

Online mentoring or "telementoring" has been implemented with increasing frequency in elementary and secondary schools over the last decade, as a way to link students' school work with that of adult communities of practice, and open their work to a wider responsive audience. It is widely acknowledged that in telementoring programs, maintaining participants' interest and engagement is vital; but little empirical research has directly addressed the question of what rewards participants (particularly mentees) seek through their participation. Program designers have their own sense of what it means for their work to succeed, but what do the participants *themselves* think of as success? Knowing more about this would potentially enable program designers to provide more effective orientation and support.

This study used a variety of quantitative methods to examine possible influences on 72 adolescents' perceptions of success in a curriculum-based telementoring program called Tracking Canada's Past. Findings indicate that among the variables measured for this study, students' judgments of success were best predicted by:

- their mentors' helpfulness in asking questions about their ongoing research
- their mentors' helpfulness in recommending reading materials and web resources to support their work
- their mentors' helpfulness in helping students develop questions to investigate
- students' enthusiasm for the on-line discussion space in which they worked with their mentors
- students' trust of their mentors.

In the analysis of the full dataset, we also examined how students' initial desires for particular mentoring functions differed from their mentors' initial desires to provide them, and the changes that took place in students' desires for specific telementoring functions from the beginning of the program to the end.

Introduction

Knowledgeable adults have traditionally become involved in K-12 education in a variety of ways: visiting to give presentations about their careers, meeting students on field trips, and offering personal tutoring, for instance. While these activities have been significant, they have not always been available for students because of the physical distance or the conflicting schedules separating school children from adults (O'Neill and Harris, 2000). O'Neill (2001, p. 8) illustrates the limitations of such traditional forms of involvement using a quotation from one of the teachers involved in his work:

> It's a very limited amount of time in your students' [lives]. For instance [a program I'm familiar with] sent lawyers into the classroom. And this is a very nice program, they'd be there every week for a period, over three weeks or four weeks. But what if the kid, in the interim, thought of something, or had a dimension that they wanted to talk about? If the classroom teacher wasn't in a position to discuss it with them, or didn't have the knowledge to discuss it with them, then it was on hold for a week. [It's important to take advantage of the student's curiosity] before it diminishes in their view of things that are crucial and important.

Another way that adults contribute to students' education is through mentoring, either face-to-face or online. The term "mentoring" implies "the support given by one (usually more experienced) person for the growth and learning of another, and for their integration into and acceptance by a specific community" (Hobson, 2002, quoting from Malderez, 2001, p.57). In the context of K-12 education, mentoring often involves a relationship between a student and an older, more experienced person on a regular basis over a period of time to improve educational achievement. Today, the Internet provides flexible communication environments in which students and knowledgeable adults can have relationships on-line, with relaxed time and space constraints. This kind of on-line mentoring is often called "telementoring".

In telementoring, students and mentors' communications are not limited to weekly visits (O'Neill & Gomez, 1998; Foster, 1999; Wheeldon & Lehmann, 1999; Hamilton and Scandura, 2002). Moreover, students have the opportunity to pursue their specific curriculum-related interests and develop a deeper understanding of them (Foster, 1999; O'Neill and Harris, 2000; Neils, 2002). Students have the freedom to explore their curiosities even if their teacher has limited expertise in a specific subject, or does not have time to support them in all the ways they desire (O'Neill and Harris, 2000). Telementoring also provides an avenue for students to pursue their interest in subjects that they may not feel comfortable in discussing face-to-face (Cravens, 2002). Finally, orchestrating mentoring relationships on-line increases teachers' pool of available mentors. They do not need to rely on only the businesses in their communities as sources of mentors (Foster, 1999; Hamilton and Scandura, 2003).

For these reasons, telementoring has been implemented with increasing frequency in both elementary and secondary schools over the last decade as a way to link students' school work with communities of specialist adults (Neils, 1994; Harris et. al., 1996; O'Neill, Wagner, et al., 1996; O'Neill and Gomez, 1998; Tsikalas and McMillan-Culp, 2000; O'Neill and Scardamalia, 2000; O'Neill et. al., 2003). Some of these programs are global in scope, such as the "Electronic

Emissary" Project run by Dr. Judi Harris at the University of Texas at Austin since 1993, and the "International Telementor Program" founded and directed by David Neils since 1994.

Based on these and other projects, an array of recommendations has been made about how to maximize the rate of success among relationships supported by a telementoring program. In many cases, following these recommendations appropriately requires considerable adaptation of general advice to the particular needs and desires of an audience. For example, it is clear that some up-front training or orientation for mentees can be useful (Kasprisin, et al., 2003); but what should this training be like? Research has shown very clearly that training will often fail to influence behaviour unless it addresses students' prior conceptions (Bransford et al., 2000); but what are these where telementoring is concerned? To date, there has been little research addressing K-12 students' expectations of telementoring, and how these expectations are influenced by actual experience with telementoring. This study aims to begin filling this important gap in research knowledge.

Recommendations for "Success" in Telementoring

The telementoring literature contains an array of guidelines on how to implement "successful" telementoring programs for K-12 students (Harris et al., 1996; Sanchez and Harris, 1996; Robb, 1997; O'Neill and Gomez, 1998; Tsikalas & McMillan-Culp, 2000; O'Neill et al. 2000; O'Neill and Harris, 2000). For instance, in the literature we find the following recommended strategies to maximize the success rate of relationships supported by a program:

- Develop students' skills to represent what they do and do not understand (Tsikalas & McMillan-Culp, 2000);
- Provide up-front training for mentors, and define goals and expectations for all participants (Robb, 1997);
- Have an on-line facilitator to help participants adjust the amount of time they commit to the program, the frequency of their messages exchanged, and the types of communication they engage in (Harris et al., 1996);
- Educate students about mentors' different roles and functions (Tsikalas & McMillan-Culp, 2000);
- Have a schedule and stick to it (Sanchez and Harris, 1996), and
- Communicate with mentors to inform them of the students' reactions to messages (Sanchez and Harris, 1996).

While we do not doubt that practice is improved when these recommendations are followed appropriately, in many cases doing so requires considerable adaptation of the general design advice to particular circumstances. For example, to be truly effective training for mentees must arguably address their specific expectations; and to do this, trainers must know what those expectations are. Unfortunately, there has been little research addressing K-12 students' expectations of telementoring relationships, and how these expectations are influenced by actual experience with telementoring.

O'Neill and Gomez (1998) suggested that many first-time mentees in a curriculum-based telementoring program appear to judge the success of mentoring with respect to whether their

mentors engage in a large amount of "knowledge-telling", or offer extensive information resources. However, in orchestrating three successive telementoring relationships for secondary students over the course of a school year, they observed that students' desires for mentoring functions changed from focusing purely on "help finding data" to functions more closely related to the process of an inquiry, such as "asking useful questions" and "providing feedback on progress".

In a later paper, O'Neill (in press) showed that telementoring in an "open" mode, in which mentees can read the telementoring dialogues of other mentors and mentees, can positively influence students' ideas about success in such relationships. He explains that "peeking" at others' telementoring dialogues can offer students models for their own behaviour in the telementoring relationship. Such "free model-seeking", as it is called, allows the students to develop more mature understandings of the telementoring relationship, and the kinds of advice or guidance they may be able to receive from their mentors.

While previous studies have hinted at the desires that students may wish to fulfil through telementoring relationships, no published study we know of has directly addressed this question on an empirical basis. This is an important oversight, since in a telementoring program one may define "success" in a variety of ways. For example, it may be defined as meeting the pre-determined goals of the program. In the context of the present study, the Tracking Canada's Past team had hoped that after the completion of the 10-week project, the level of sophistication in students' thinking about historical evidence and methodology would increase. This outcome has been produced on a limited scale (O'Neill and Sohbat, 2004) and from this perspective, the project has been successful.

On the other hand, we can also define success relative to mentors' and students' individual satisfaction. Generally speaking, what students mean by "success" is not a straightforward question, since "success" is a relative and subjective term. Depending on a participant's individual, cultural, and social values, his/her definition of success may vary (Kalas, 2000; Marshall, 1997). In one study of adolescents' perceptions of success, Kalas (2000) stated that adults' ideas of success are not always the same as teens' ideas for success. Since in our telementoring relationships, the mentors were all adults and the mentees were adolescents, it is likely that they have had different conceptions of success. For instance, a mentor's goal might be to help his or her mentees understand the practice of historical research, while a mentee's goal might be to maximize their grades, or the warmth of their relationship with the mentor.

Each of the aforementioned conceptions of success, or a combination of them, might have influenced our students' overall impression of success in their mentoring relationships. In the present study, data were not available to address all these possible influences on students' judgments of success in telementoring relationships; but we have examined the functions sought and provided in such relationships and tried to explain what students meant by "success" in these terms. Below we examine data from pre- and post-project surveys administered to students to develop a greater understanding of a) what shapes students' judgments of "success" in telementoring relationships, and b) how experience with telementoring changes these expectations. Within the program structure of Tracking Canada's Past, we were interested to know how and to what degree the functions that mentors provided for their mentees, the mentees' expectations of the mentoring relationship, and students' demographic characteristics

shaped high schoolers' judgments of success in the relationships. We pursued these questions through a variety of statistical techniques, including multiple regression and factor analysis.

The results of our analysis were, in some ways, surprising. They show that while prior to beginning of the project, students' desires focused largely on securing information resources and getting answers to factual questions, their ultimate perceptions of success were best predicted by the helpfulness of the questions their mentors asked *them*, the help their mentors offered in developing questions for their research, the usefulness of the websites and other reading materials that mentors recommended, and the helpfulness of the on-line discussion space itself. Students' judgments of success were also influenced substantially by the tenor of their relationships with their mentors, including their mentors' perceived trustworthiness. Interestingly (and encouragingly), students' demographic characteristics did not contribute to students' perceptions of success, and variables such as their grades at school, their plans for further schooling or work, and their academic self-concept, appeared to influence their judgments of success to a much lesser degree.

Context of the Study

Tracking Canada's Past (TCP) is a curriculum-based telementoring project that provided the context for this study. Its overarching goal is to help secondary students understand the concept of history as a discipline through on-line mentoring and the use of "primary" source material, in addition to their textbooks. In the project, teachers from participating schools involve their students in research relating to the Canadian Pacific Railway in their local communities. This was Canada's first transcontinental railway, which transformed the country in many important ways. Over the course of several assignments spread over 10 weeks, each student develops a research question or topic of interest, and explores it using primary sources such as archival material, letters, local historic sites and artefacts. Students bring their diverse evidence to the Knowledge Forum[1] ® workspace, consult with their mentors, teachers, and other students, and learn history in a way that roughly parallels historical research. By the conclusion of the project, they write an original historical narrative based on their research.

Tracking Canada's Past has been carried out in five schools (three in the Lower Mainland of British Columbia and two in Toronto) since 2002. This paper examines data from three very different schools participating in 2003. Eighty-nine students from four Social Studies 10 classes provided research consent forms (out of 108). Twenty-one of the participating students were from one Social Studies 10 class at Riverside Secondary School. This school is located in a small industrial town of 30,000 people, chosen for its proximity to the railway. The class was largely Caucasian, and the majority of the students did not expect to attend university. Twenty-eight students were from a Social Studies 10 class at King's Cross School, located in an affluent urban neighbourhood. These students were traditionally successful in school, and all but one expected to attend university. The remaining 40 students were from two Social Studies 10 classes at Metro South School, located in a densely populated metropolitan area. Both the school population and the population of the participating regular-track class were quite racially mixed. The majority of the students declared they would like to attend university after graduation. There were 17 mentors participated in this project. We had permission to use data for 16 of them.

[1] Knowledge Forum is the registered trademark of the developers *Learning in Motion, Inc.*

Mentor Matching

The primary principle according to which mentors and mentees were matched was the "fit" between students' expressed research interests for the project and mentors' expertise. A list of 91 possible topics and subtopics related to the Canadian Pacific Railway was prepared by the facilitator of our project, and posted on the TCP website[2]. Students were asked to connect to the website, and declare a topic of interest through their teachers by a specific date. Our volunteer mentors had previously used this same checklist of topics on an application form, to identify areas in which they felt comfortable working with students[3]. After our project facilitator received students' areas of interest, she matched a number of students with the same or similar interests with an appropriate research group and mentor.

The matched working groups in our Knowledge Forum workspace were as follows:

- Architecture (10 mentees)
- Arts and Culture (9 mentees)
- Building the Railway 1 (9 mentees)
- Building the Railway 2 (8 mentees)
- Building the Railway 3 (7 mentees)
- Environmental History (8 mentees)
- Labour History 1 (8 mentees)
- Labour History 2 (8 mentees)
- Labour History 3 (10 mentees)
- Legal History 1 (9 mentees)
- Legal History 2 (10 mentees)
- Native Peoples (8 mentees)
- Political and Military History (7 mentees)
- Social History 1 (5 mentees)
- Social History 2 (11 mentees)
- Tourism (8 mentees)
- Transportation and Communication (10 mentees)

As this list shows, each working group had a different number of students, ranging from 5 to 11, based on the popularity of the research theme. At the time matches were created, each working group was given its own "view" (similar to a folder) in the Knowledge Forum workspace, and a biographical description of the assigned mentor was posted in the view. In this view, students could discuss their ongoing research with one another and with their mentor. However, students and mentors were able to access all the views, and read other students' and

[2] http://www.trackingcanadaspast.org/

[3] This form is a small part of a software system called Telementoring Orchestrator, developed to support online mentoring programs. It is highly customizable, and can be downloaded free for non-commercial use at http://www.telementoring.ca/

mentors' notes whenever they wished. Each mentor was asked to log on to the system and check his/her mentees' notes three times a week if possible.

Working Online

To help structure students' work over the lengthy project, a set of "milestone" assignments was provided on the project website. At the time that the students were assigned to their mentors, they had completed Assignment #1, "Choosing a broad theme or topic", with the help of their teacher. After that, they went through the remaining assignments with the help of their mentors and teachers:

- Milestone Assignment #2: Creating a framework for your research
- Milestone Assignment #3: Doing exploratory research and organizing your sources
- Milestone Assignment #4: Drafting your prospectus
- Milestone Assignment #5: Your final prospectus
- Final paper

Mentors were provided with instructions on using the Knowledge Forum software through email, and an instructional website. Students received the same instructions from the administrator of the project and his research assistants. The administrator also introduced the idea of on-line mentoring to the students in a face-to-face session. Many of the students were familiar with MSN Messenger and chatting online with friends; however, they were not familiar with the idea of working online with an adult on a research project. Two videos were also produced for participating classes: one on "Getting Started with TCP", explaining the goal of the project, who the participants were, etc.; and the other describing the roles of the mentors and students in a telementoring relationship. Each class received a copy of the videos on VHS cassette.

In addition to pre-training for the volunteer mentors and students in our project, we provided the participants with some external support from a facilitator who was a Ph.D. student in History. Besides the aforementioned supports that she provided in preparing the list of topics of interest, our facilitator followed the online dialogues, helped mentors with issues that arose, and assisted some students when their assigned mentors were not able.

Data Sources

The data analyzed for the present study include:

- Pen-and-paper surveys administered to students and adult mentors both prior to and after the curriculum unit.
- Videotaped small-group interviews with some students conducted after completing the unit. This was a stratified sample, based on students' level of engagement with their mentors.
- Face-to-face or telephone interviews with each mentor after the completion of the unit (30-45 minutes long, semi-structured).

- Automatically generated records of students' and mentors' activities with the Knowledge Forum throughout the curriculum unit.

Here we have principally used quantitative methods of analysis, illustrating our findings with quotations from semi-structured interviews with program participants.

Research permission was granted for 89 students (and 16 mentors). After excluding those students who had missed one of the pre- or post-unit surveys, the number of data points available for analysis was 77. In our initial analysis it became clear that 5 of these students had not posted or read any notes in Knowledge Forum over the course of the project; therefore, their responses to questions about their relationships with their mentors or their mentor's helpfulness were deleted from the dataset. This brought the number of data points available for analysis to 72.

Students' and Mentors' Expectations of the Relationship

In all mentoring relationships, both the mentors and mentees have some initial needs and expectations (Kram, 1985). Our interviews suggested that regardless of how telementoring is introduced, many students cast their mentors as "experts". What students conceive experts to be, however, probably varies; and unfortunately, despite many years of basic psychological inquiry into the nature of expertise, students' *beliefs* about "experts" have been studied infrequently (Tynjala et. al., 2002). It seems likely that many students' ideas about experts come from popular media: depictions of "experts" in movies, appearances of professors on TV news to provide "analysis" of news events, etc. In this case, students might expect their mentors to be very knowledgeable about the specific topics they inquire into, and respond quickly to all their questions. This set of issues cannot be explored fully in the scope of this study, given the data available; but a greater awareness of students' expectations may allow educators to increase the rate of success in telementoring relationships. With this in mind, we present below some descriptive statistics regarding students' and mentors' expectations of mentoring, supported by some quotes from their closing interviews.

The pre-survey administered to students before the project began contained a list of 13 telementoring functions (types of advice, guidance or help that mentors might provide for their mentees), designed to fit the context of an inquiry telementoring project like Tracking Canada's Past. Students were asked to indicate what they thought a "mentor" might do for them, by rating the extent to which they expected to receive each function on a scale from 1 to 7 (where 1=a little and 7=a lot):

- Help me come up with a project question/idea to investigate
- Ask me questions to help me think about my project
- Answer questions I have about specific people, events or ideas in history
- Give me background information on my topic
- Give me locations on the Internet where I can find resources to answer my questions
- Help me to understand material I read about my topic
- Suggest challenging things for me to do that could improve my project
- Review my work as I go along and help me keep on track

- Give me the names and addresses of other people to contact about my project
- Help me to meet project deadlines
- Suggest specific strategies that will help me get my work done
- Suggest books or other sources that I should read
- Help me understand what historians do each day

Below we summarized the percentage of students who expressed a strong desire to receive each function, by rating it between 5 and 7. The top five functions that students were interested to receive were[4]:

- Help me to understand material I read about my topic (83.1%)
- Answer questions I have about specific people, events or ideas in history (73.2%)
- Give me background information on my topic (71.4%)
- Give me locations on the Internet where I can find resources to answer my questions (70.4%)
- Suggest books or other sources that I should read (69%)

The bottom five functions were:

- Suggest challenging things for me to do that could improve my project (50.7%)
- Help me come up with a project question/idea to investigate (49.3%)
- Ask me questions to help me think about my project (45.1%)
- Give me the names and addresses of other people to contact about my project (35.2%)
- Help me understand what historians do each day (26.8%)

As these percentages make clear, before entering the telementoring project most students were most interested in receiving information resources about their topic than being asked questions or have their thinking challenged by their mentors. Since these are the types of guidance that students tend to associate with getting started on a project, O'Neill (in press) refers to them as "inquiry jumpstart" functions. Few students involved in the project were initially interested in being asked questions by their mentors, offered challenges, or understanding what historians do.

Students' post-project interviews shed some light on these responses. As one of the students remarked in response to the question of what he thought his mentor would do for him:

> I thought that he would give me some sources like where I could go, like some websites or some books that I could go and like find some more information on the topic, like he could give me the name of the books and find out the information I required.

Another student remarked:

[4] Numbers in parentheses show the percentage of students who expected to receive each function.

> … tell us information that is about our topic, like how to get it and where to look, and tell us factual information on it.

Some explanation of these responses comes from a student whose mentor had posted a "getting started" message in the Knowledge Forum at the start of the project. He commented in interview:

> That was very helpful. It gave us like a good starting point, like to have somewhere to begin… getting started is one of the hardest parts, because you are so sort of overwhelmed by, like, "where do I go next?" and things like that.

Mentors' Desired Activities

Volunteer mentors for Tracking Canada's Past were given the same list of 13 mentoring functions as the students in their pre-project surveys, and asked to rate each one with respect to how enthusiastic they were to provide it. This was intended to show how complementary our mentors' expectations were with those of their prospective mentees.

Perhaps not surprisingly, as a group, our mentors declared quite different expectations from their future mentees. Almost all of the mentors showed a strong desire to offer functions that would keep them regularly involved in their mentees' work: the types of advice that put them in a role of "prodding partner", as O'Neill and Scardamalia (2000) discuss. The functions most and least frequently rated 5-7 on a scale from 1-7 (1= a little and 7= a lot) are summarized below.

The top five functions that mentors desired to offer were:

- Ask students questions to help them think about their project (100%)
- Help students come up with a project question/idea to investigate (100%)
- Suggest challenging things for students to do that could improve their project (93.3%)
- Suggest specific strategies that will help students get their work done (93.3%)
- Help students to understand material they read about their topic (86.7%)

The bottom five functions that mentors desired to provide for students were:

- Answer questions students have about specific people, events or ideas in history (80%)
- Review students' work as they go along and help them keep on track (75%)
- Help students to meet project deadlines (66.7%)
- Give students locations on the Internet where they can find resources to answer their questions (60%)
- Give students the names and addresses of other people to contact about their project (42.9%)

It is worth noting that the first three functions that almost 100% of mentors desired to provide were among the functions that students *least* desired to receive initially. Results from

closing interviews suggest that mentors wanted to be viewed as advisors, available to offer guidance on the substance of students' work, and help them understand how historians work or think, rather than merely offering answers to factual questions, or handing them resources to get started. As one of the volunteers explained:

> [I wanted] to be there to answer the academic questions as best you can, but not to sit and baby-sit the students with – oh here's all the texts you're going to need and here's the completed paper just hand it in – it's a case of just sort of paving the way for them to be able to do it themselves.

Another mentor gave a more elaborate answer:

> My understanding going into it was that I would act as somewhat of an advisor answering questions, you know, students coming to me and I would be able to kind of steer them into the right path…whether that be recommending books, answering questions or that sort of thing… It ended up being a little bit different than that…
>
> Interviewer: In what sense?
>
> I think a lot of the students were coming to me for different reasons, they were coming to me to get motivated, to get clear on a topic, to, I think, just show the fact that they had done something for their teacher, you know, I think only three of the students that I had this last time around actually used me in the way I thought that I would be used as a mentor.

Students' Judgments of Success

To get an impression of the tenor of students' relationships with their mentors, we asked students to rate the following statements in the post-project survey. Students needed to circle a number from 1 to 7 (1=disagree strongly and 7=agree strongly) to show how strongly they agreed or disagreed with each statement. Percentages given beside each statement below show that the majority of students (over 70%) agreed with each statement by choosing a rating of 5, 6, or 7.

- My mentor was friendly to me (80.6%)
- My mentor seemed to have carefully read the notes I posted (72.2%)
- My mentor showed respect for me (86.1%)
- I trust my mentor (73.2%)
- I respect my mentor (88.9%)

Clearly, the majority of the students involved in the project felt they had a trusting and respectful relationship with their mentors. One might naturally expect students' ratings of the overall success of their relationships to be quite high; but this was not the case. In fact, students' rated agreement or disagreement with the statement "Overall, the mentoring was a success for

me" (1= disagree strongly and 7= agree strongly) was normally distributed, with 49.3% of the students agreeing that the mentoring was a success for them by rating 5-7.

To understand why the telementoring relationships were not considered successful by so many students, despite their evidently positive attitudes about their mentors' trustworthiness, friendliness, and so on, we included eight statements in the post-survey asking students for their own understanding of the reasons why their relationships were not successful. Students were encouraged to check as many statements as they thought applied in their particular case. Out of 72 respondents, 34 students explained a lack of success in their mentoring relationships by checking one or more of these statements. In the following list, the numbers in first parentheses show the number of the times that these statements were checked by students. The second parentheses indicate the percentage of students who checked the given reason.

- I didn't keep in touch with my mentor because I didn't really need or want help (15) (20.8%)
- My mentor tried to help, but didn't understand what I needed (14) (19.2%)
- My mentor responded too slowly to be helpful (13) (17.8%)
- I didn't start communicating with my mentor early enough (9) (12.5%)
- My mentor never answered me (5) (6.8%)
- My mentor was too busy to help me very much (5) (6.8%)
- My mentor tried to help, but didn't know much about my topic (3) (4.2%)
- My mentor and I didn't get along (0) (00.0%)

A quick look at the data shows that 20.8% of the students did not invest effort in the relationship because they did not need or want help. Altogether, nearly half of the 34 students who found their relationships unsuccessful did not feel they needed help for their projects — though the project was quite demanding by high school standards. Removing these 15 students from the dataset, the rate of judged success increases from 49.3% to 62.5%.

Relationship Between Success and Other Variables Measured

To gain an initial sense of the variables that may have influenced students' impressions of the overall success of mentoring, we computed correlations between the "success" variable and the following additional variables measured for our larger study:

- Demographic variables, including students' age, gender, and their parents or guardians' educational attainment
- Students' school interest and experience, including their average grades, and their orientation to subjects such as English, Math or Fine Arts
- Their ideas about learning in school
- Their ideas about the nature of intelligence (measured using an instrument from Dweck (2000))
- Their expectations for future work or study

- Their mentors' helpfulness (the functions that students reported their mentors provided for them during the project)
- Their relationship with their mentors, including a) their mentors' friendliness, b) the degree to which they felt their mentors read their Knowledge Forum notes carefully, c) the degree of respect they felt their mentors showed for them, d) the trust they placed in their mentors, and e) the respect they held for their mentors.
- Their impressions of the online discussion space
- The number of messages they posted and read in the Knowledge Forum workspace

Analyses revealed that the following variables correlated significantly and positively with students' impressions of the overall success of mentoring:

Table 1: Correlations Between the "Success" Variable and Other Variables

Tenor of the Relationship with the Mentor	**Correlation**
I trust my mentor	0.595**
My mentor seemed to have carefully read the notes I posted	0.572**
My mentor is friendly	0.566**
I respect my mentor	0.537**
My mentor showed respect for me	0.435**
Student Background	
Students' average grade in school (self-report)	0.324**
Students' post graduate plans (work, university, community college, or other)	0.302**
Students' academic self-concept (their orientation to math subject)	0.278*
Students' ideas about learning in school (All the questions should get answered as we learn more and more)	0.308**
My mentor asks me questions to help me think about my research (students' expectation)	0.299**
My mentor helps me understand material I read about my topic (students' expectation)	0.247*
Student Work on Project	
Number of hours the student put into writing the final report (self-report)	0.402**
Online Activity and Attitude	
Number of notes the student posted in Knowledge Forum	0.406**
Degree to which the student found the public nature of Knowledge Forum helpful	0.406**
The number of notes the student read by his/her assigned mentor in the Knowledge Forum	0.267*
Mentor's Helpfulness	
Asked me questions to help me think about my research	0.686**
Suggested specific strategies that would help me get my work done	0.616**
Helped me come up with a project question/idea to investigate	0.612**
Gave me web locations where I can find resources to answer my questions	0.597**
Answered questions I had about specific people, events or ideas in history	0.555**
Reviewed my work as I went along and helped me keep on track	0.551**
Suggested books or other sources that I should read	0.531**
Suggested challenging things for me to do that could improve my project	0.512**
Helped me to understand material I read about my topic	0.481**
Gave me background information on my topic	0.476**
Helped me to meet project deadlines	0.473**
Helped me understand what historians do each day	0.423**

* = $P<0.05$ ** = $P<0.01$

As shown in Table 1, students' background including their average grade, their plans for work or further schooling after graduation, and their academic self-concept, were among the least strongly correlated with their judgments of success in their telementoring relationships, while the particular functions provided by mentors were among the most strongly correlated. Students' demographic characteristics, including their age, gender, and their parents or guardians' educational attainment, did not correlate significantly with their judgments of success in such relationships.

Based on the correlation results, multiple regression was performed using students' impression of the overall success of mentoring as the dependent variable and the variables showing the strongest correlations as independent variables. The aim of multiple regression is to build a predictive model reflecting the possible influence of several independent variables on the dependent variable (Frankfort-Nachmias and Leon-Guerrero, 2002).

As Table 2 shows, among the statements describing students' understanding of what their mentors actually tried to do for them, three contributed significantly to predicting success, as judged by students: "My mentor asked me questions to help me think about my research", "My mentor suggested books or other sources that I should read", and "My mentor helped me come up with a project question/idea to investigate". In addition, "Doing my work in the Knowledge Forum, where other students could see it and I could see their work, was helpful to me", and "I trust my mentor" were significant contributors. Variables such as students' average grades in school, their academic self-concept, and their plans for work or further schooling after graduation did not provide any additional predictive power to the model, although they were significantly correlated with the success variable.

Table 2: Predictors of "Success"

Independent variables	R Square	R Square change	Sig. F change
1. My mentor asked me questions	44.6%	44.6%	.000
2. I trust my mentor	54.4%	9.8%	.000
3. Knowledge Forum helpfulness	58.7%	4.2%	.014
4. My mentor suggested books or other sources to read	62.7%	4%	.012
5. My mentor helped me come up with a project question/idea to investigate	65.1%	2.4%	.044

Probability of F: Entry: .05 Removal: .10

Since the "Knowledge Forum helpfulness" variable was not completely connected to the other four variables which were all about mentoring relationships, we removed it and ran the regression model over again. This could let the influence of other variables emerge in case they were overwhelmed by "Knowledge Forum helpfulness". As shown in Table 3, the only variable which was changed was "My mentor suggested books or other sources that I should read". This was replaced with "My mentor gave me web locations"; the variable that had the highest inter-correlation with ($r = .729$, $P < .01$). The second model resulted in almost the same predictive power as the first model.

Table 3: Multiple Regression Analysis for Success Without "Knowledge Forum Helpfulness" Variable- Model II

Independent variables	R Square	R Square change	Sig. F change
1. My mentor asked me questions	44.6%	44.6%	.000
2. I trust my mentor	54.4%	9.8%	.000
3. My mentor suggested web resources	58.6%	4.2%	.015
4. My mentor helped me come up with a project question/idea to investigate	61.4%	2.8%	.038

Probability of F: Entry: .05 Removal: .10

According to Models I and II, the significant contributors to students' perception of success were:

- the helpfulness of the questions that mentors ask students,
- the trust that students place in their mentors,
- the reading materials that mentors suggest to students, or, the Internet resources that mentors recommend,
- how helpful students consider Knowledge Forum to be, and
- mentors' help to students in shaping questions to investigate.

It is interesting to note that the two functions students *least* desired to receive at the beginning of the project, "Ask me questions" and "Help me come up with project questions or ideas to investigate", were the two functions shown in both regression models to most strongly contribute to students' impressions of success in mentoring. While most of the students did not enter the project expecting their mentors to ask *them* questions or help them come up with questions or ideas to investigate, these were ultimately the strongest apparent influences on their perceptions of success.

The explanation for this reversal appears to be that students simply did not have the experience to anticipate which types of advice would be beneficial to the kind of authentic historical inquiry demanded by Tracking Canada's Past. As two students explained in their post-project interview:

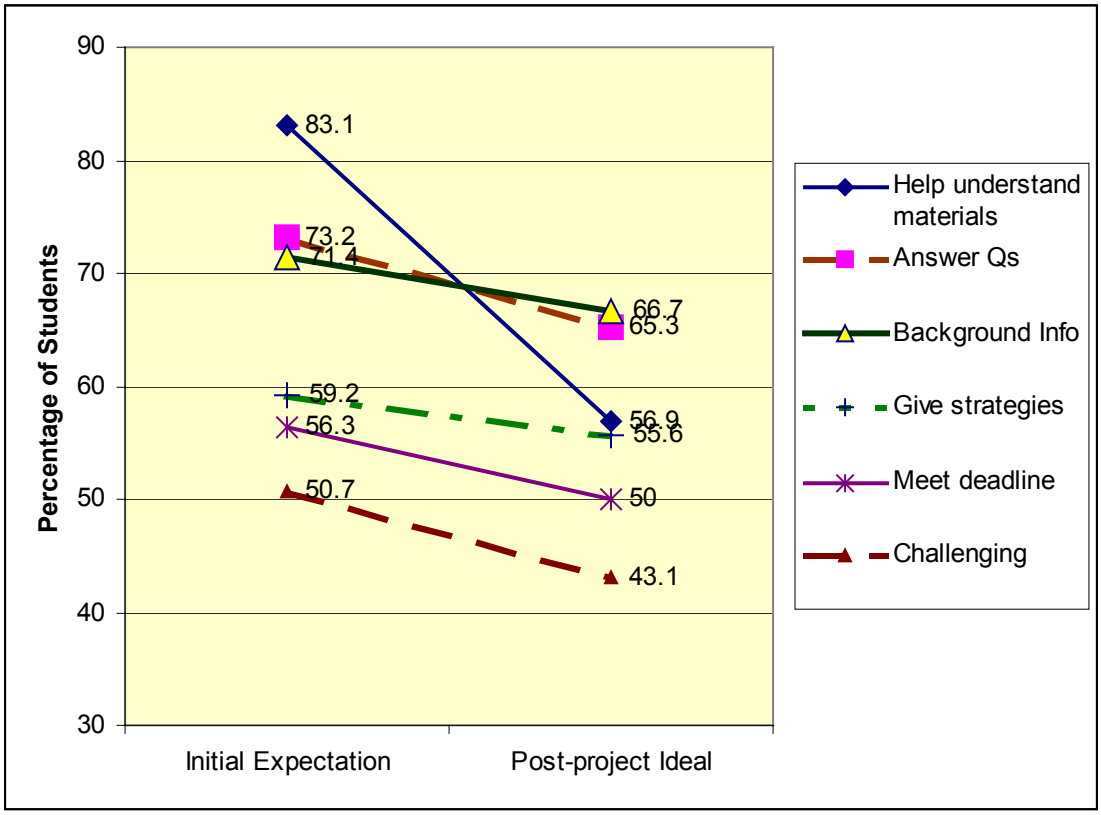
> Student 1: At the beginning I was really confused, and now that I look back I can't really remember what I was confused about, so I think it just sort of works out throughout the project.
>
> Student 2: Yeah, it works out eventually.
>
> Student 1: It's just because it's so new, yeah, it's *so new* that you are confused about what to do.
>
> Student 2: Yeah.

Pre-Post Changes in Students' Desires for Telementoring Functions

Another objective of this study was to understand how the experience of telementoring changes students' desires for telementoring functions. To this end, students completed an item on the post-project survey asking "What would your mentor ideally have done?" This item paralleled the design of the pre-project survey, in that students were asked to rate the same list of 13 mentoring functions.

Figures 1 and 2 display the results of this analysis. Once again, percentage figures indicate the proportion of students who rated each function between 5-7 in terms of its importance. For clarity, we present the functions for which students' desires decreased in Figure 1, and the functions for which students' desires increased in Figure 2. [5]

Figure 1: Comparing Students' Desires to Receive Each Function in Pre- and Post-Surveys, Functions Going Down



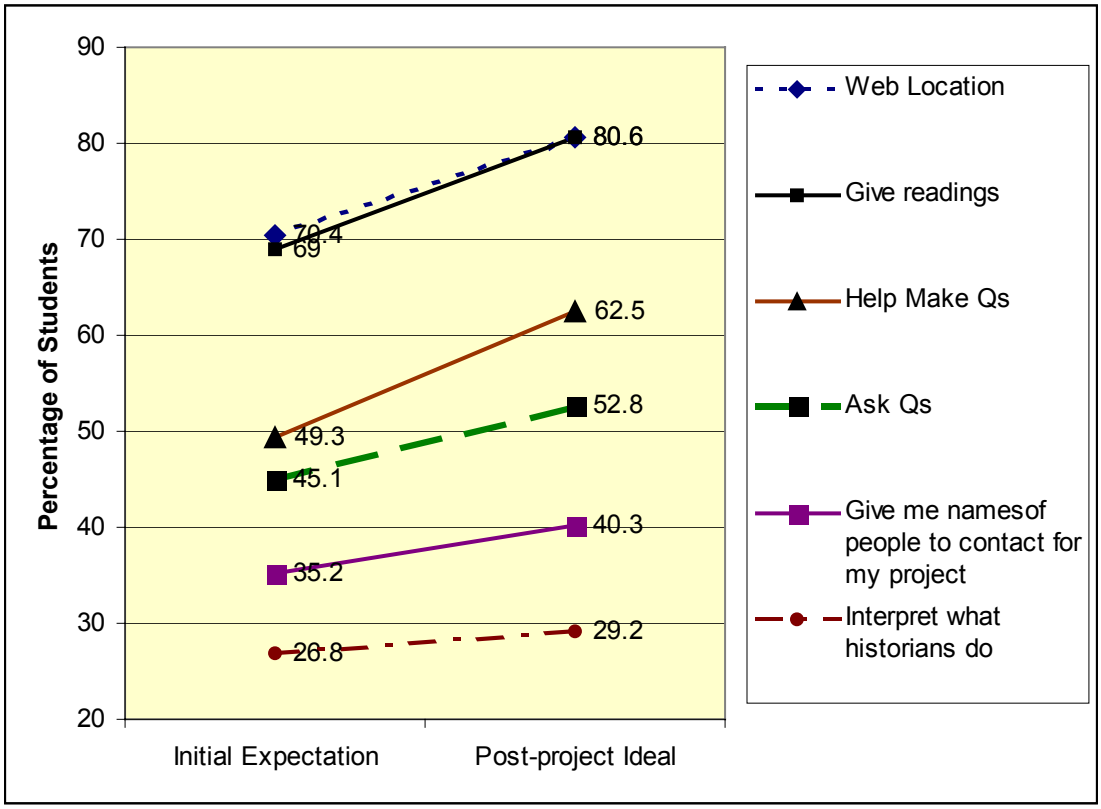
In Figure 1, we see the sharpest decline in students' desire for help in understanding the source materials they collect for their investigations. We suspect this decline is due to students' realization over the course of the project that close guidance in interpreting texts or other source evidence is not very effectively provided at a distance under the conditions provided in this study. Because many students were pursuing questions relating to local history, their mentors

[5] The function "Review my work as I go along" remains pretty much unchanged from pre to post (the amount of decrease is less than one); thus, we did not include it in Figure 1.

frequently did not have access to copies of the same materials they were studying (for example, unpublished archival material). These conditions made this type of advice quite impractical.

Students also appear to have learned that it was of less use than they initially thought for their mentors to provide them with background information, or answers to factual questions. On the other hand, as Figure 2 shows, students developed a greater desire for some of the "partnership" functions over the course of the 10-week project. While they continued to find guidance to information resources quite important, they placed a somewhat stronger value on understanding what historians do, and a far stronger value on advice in crafting investigable questions at the end of the project than at the beginning.

Figure 2: Comparing Students' Desires to Receive Each Function in Pre- and Post-Surveys, Functions Going up



The strength of mentees' desires for specific mentoring functions gives us one indication of how they understand the potential of these relationships relative to their own goals. Another indication lies in how mentees view the functions as relating to one another. To examine this, we carried out factor analyses on the same set of pre- and post-project function ratings. Factor analysis is intended to reveal how variables clump together. This statistical technique can reveal underlying factors which may be the root causes of variation in the data. Variables with high loadings on a specific factor are those that are highly correlated with one another, but have little or no correlation with the variables highly loaded on the other factors (Kachigan, 1991).

The results of factor analyses on students' pre and post ratings of the 13 telementoring functions are presented in Tables 3 and 4. With respect to students' initial expectations, there appeared to be four underlying factors. Of particular interest to us in the present study is Factor IV, on which just one variable loads.

Table 3: Factors Underlying Students' Initial Expectations of Mentoring Functions

Factors and the high-loading variables	Factor loadings
Factor I	
Suggest specific strategies	.86
Help me meet project deadlines	.76
Give web locations	.71
Help me interpret material	.71
Review my work	.60
Factor II	
Suggest challenging things	.81
Ask me questions	.79
Give me names of people to contact	.72
Suggest books and reading material	.59
Factor III	
Help me come up with questions to investigate	
Give me background information	.74
Answer my questions	.72
	.70
Factor IV	
Help me understand what historians do	.83

The dissociation reflected here between "Help me understand what historians do" and the functions loading on the other three factors suggests that as the students began participating in Tracking Canada's Past, they did not generally view the guidance and advice they expected from their mentors as relating to an understanding of historians' work.

The situation with students' post-project ideal functions was, however, quite different. In this analysis, the number of factors decreased from four to three, with the function "Help me interpret what historians do" loading strongly on the first factor (Table 4). The three functions "Help me interpret material", "Suggest specific strategies", and "Review my work" loaded on more than one factor with almost the same magnitude; therefore, we do not list them in the summary table (Kachigan, 1991).

Table 4: Factors Underlying Students' Post-project Perceptions of Ideal Mentoring Functions

Factors and the high-loading variables	Factor loadings
Factor I	
Help me understand what historians do	.87
Ask me questions	.72
Suggest challenging things	.72
Give me names of people to contact	.65
Factor II	
Give web locations	.81
Answer my questions	.74
Suggest books and reading material	.72
Give me background information	.61
Factor III	
Help me meet project deadlines	.79
Help me come up with questions to investigate	.77

While one must always be cautious in interpreting the results of factor analyses, we find it encouraging that over the course of Tracking Canada's Past, students appeared to develop an appreciation of the relationship between the understanding of what historians do and the posing of questions about their ongoing investigations – the latter of which was strongly predictive of their judgments of success in the telementoring relationship.

Discussion

The purpose of this analysis was to develop a deeper understanding of what high school students mean by "success" in their telementoring relationships, by examining the variables that best predicted their perceptions of success in these relationships. While the telementoring literature provides an array of recommendations about implementing "successful" telementoring programs for K-12, the application of these recommendations should ideally be informed by some detailed knowledge of the expectations that mentees carry into their telementoring relationships. To this end, we examined in detail 72 adolescents' expectations of their relationships with assigned telementors in a curriculum-based program, both prior to and after the project. We compared their expectations with their mentors', and computed regression models to see which of the many variables in our dataset best predicted students' impressions of the overall success of their telementoring relationships.

Analyses revealed that students' judgments of success were best predicted by the helpfulness of the questions mentors asked, the usefulness of the reading materials and/or web resources they recommended, the helpfulness of mentors in developing questions or ideas to investigate, the level of trust students placed in their mentors, and the helpfulness of the on-line workspace where students and mentors shared their ideas. Variables such as students' average grades in school, their academic self-concept, and their plans for work or further schooling after graduation did not contribute any additional predictive power to the regression model, though they were significantly correlated with the "success" variable. This is an encouraging finding, since it suggests that even in a group of participants as diverse as ours, the most important determinants of success are those that program designers have the ability to refine over time.

It is interesting to note that among the variables that best predicted success, "My mentor asked me questions" and "My mentor helped me come up with project questions or ideas to investigate" were among the functions that students *least* expected to receive from their mentors before the start of the project. Only 45-50% of the students were interested in receiving such advice before the project began. For the most part, students initially expected their mentors to provide them with background information, web links, and other reading materials about their topic. The degree of pre-to-post change we measured in students' desires for these functions implies that students had little ability to predict which functions would actually be of value to them in the course of project. While many of them entered the program with little desire to be challenged or asked questions and a relatively strong desire to receive resources and information, over time they developed a quite different sense of what types of advice were valuable to meet the demands of the curriculum unit.

Some caveats are called for with regards to our findings. We have speculated here that the disjunction between students' initial expectations of telementoring and their ultimate impressions of success reflects learning; however, given the design of the study, we cannot know whether this learning is a consequence of students' experience of telementoring project itself, of our history project design (e.g. working with primary sources), or some combination of the two. Furthermore, because these findings emerge from the context of one curriculum-based telementoring project, many specific findings may not generalize. Mentees' needs and expectations may be influenced by the task demands of the program studied here in ways that will not hold in programs of different design.

Other researchers have investigated the influence that the interpersonal skills and personality characteristics of participants contribute to the success of mentoring relationships (Kram, 1985; Turban & Dougherty,1994). For instance, Kram (1985) states that if a mentor knows how to offer help and a mentee knows how to ask for help, the relationship will be nurtured. Our study cannot contribute anything to this body of findings, since data on participants' interpersonal skills and personality characteristics were not collected. Given the volume of data already being collected in our participating classrooms, it was impractical to administer lengthy personality instruments to our participants without risking severe fatigue effects. Perhaps it will be possible to overcome this obstacle in future research, and produce richer models than those presented here.

We also believe that in the future, good basic research should be conducted on students' conceptions of expertise – in particular, what they think "experts" are good for. From our experience it appears that in curriculum-based telementoring programs, students are prone to cast their mentors as "experts". For this reason, it would be extremely useful to have a deeper understanding of the range of ideas that students across the developmental spectrum hold about who experts are, what they do, and what can be learned from them.

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